

Building evidence for conservation globally

# Journal of Threatened Taxa

10.11609/jott.2023.15.1.22355-22558

[www.threatenedtaxa.org](http://www.threatenedtaxa.org)

26 January 2023 (Online & Print)

15(1): 22355-22558

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)

Open Access





ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher  
**Wildlife Information Liaison Development Society**  
[www.wild.zooreach.org](http://www.wild.zooreach.org)

Host  
**Zoo Outreach Organization**  
[www.zooreach.org](http://www.zooreach.org)

43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore, Tamil Nadu 641035, India  
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India  
Ph: +91 9385339863 | [www.threatenedtaxa.org](http://www.threatenedtaxa.org)  
Email: [sanjay@threatenedtaxa.org](mailto:sanjay@threatenedtaxa.org)

#### EDITORS

##### Founder & Chief Editor

**Dr. Sanjay Molur**

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),  
43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore, Tamil Nadu 641035, India

##### Deputy Chief Editor

**Dr. Neelesh Dahanukar**

Noida, Uttar Pradesh, India

##### Managing Editor

**Mr. B. Ravichandran**, WILD/ZOO, Coimbatore, India

##### Associate Editors

**Dr. Mandar Paingankar**, Government Science College Gadchiroli, Maharashtra 442605, India

**Dr. Ulrike Streicher**, Wildlife Veterinarian, Eugene, Oregon, USA

**Ms. Priyanka Iyer**, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

**Dr. B.A. Daniel**, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

##### Editorial Board

**Dr. Russel Mittermeier**

Executive Vice Chair, Conservation International, Arlington, Virginia 22202, USA

**Prof. Mewa Singh Ph.D., FASc, FNA, FNAsc, FNAPsy**

Ramanna Fellow and Life-Long Distinguished Professor, Biopsychology Laboratory, and  
Institute of Excellence, University of Mysore, Mysuru, Karnataka 570006, India; Honorary  
Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore; and Adjunct  
Professor, National Institute of Advanced Studies, Bangalore

**Stephen D. Nash**

Scientific Illustrator, Conservation International, Dept. of Anatomical Sciences, Health Sciences  
Center, T-8, Room 045, Stony Brook University, Stony Brook, NY 11794-8081, USA

**Dr. Fred Pluthero**

Toronto, Canada

**Dr. Priya Davidar**

Sigur Nature Trust, Chadapatti, Mavinahalla PO, Nilgiris, Tamil Nadu 643223, India

**Dr. Martin Fisher**

Senior Associate Professor, Battcock Centre for Experimental Astrophysics, Cavendish  
Laboratory, JJ Thomson Avenue, Cambridge CB3 0HE, UK

**Dr. John Fellowes**

Honorary Assistant Professor, The Kadoorie Institute, 8/F, T.T. Tsui Building, The University of  
Hong Kong, Pokfulam Road, Hong Kong

**Prof. Dr. Mirco Solé**

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Vice-coordenador  
do Programa de Pós-Graduação em Zoologia, Rodovia Ilhéus/Itabuna, Km 16 (45662-000)  
Salobrinho, Ilhéus - Bahia - Brasil

**Dr. Rajeev Raghavan**

Professor of Taxonomy, Kerala University of Fisheries & Ocean Studies, Kochi, Kerala, India

##### English Editors

**Mrs. Mira Bhojwani**, Pune, India

**Dr. Fred Pluthero**, Toronto, Canada

**Mr. P. Ilangoan**, Chennai, India

**Ms. Sindhura Stothra Bhashyam**, Hyderabad, India

##### Web Development

**Mrs. Latha G. Ravikumar**, ZOO/WILD, Coimbatore, India

##### Typesetting

**Mrs. Radhika**, ZOO, Coimbatore, India

**Mrs. Geetha**, ZOO, Coimbatore India

#### Fundraising/Communications

**Mrs. Payal B. Molur**, Coimbatore, India

#### Subject Editors 2019–2021

##### Fungi

Dr. B. Shivaraju, Bengaluru, Karnataka, India

Dr. R.K. Verma, Tropical Forest Research Institute, Jabalpur, India

Dr. Vatsavaya S. Raju, Kakatiya University, Warangal, Andhra Pradesh, India

Dr. M. Krishnappa, Jnana Sahyadri, Kuvempu University, Shimoga, Karnataka, India

Dr. K.R. Sridhar, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

Dr. Gunjan Biswas, Vidyasagar University, Midnapore, West Bengal, India

##### Plants

Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India

Dr. N.P. Balakrishnan, Ret. Joint Director, BSI, Coimbatore, India

Dr. Shonil Bhagwat, Open University and University of Oxford, UK

Prof. D.J. Bhat, Retd. Professor, Goa University, Goa, India

Dr. Ferdinando Boero, Università del Salento, Lecce, Italy

Dr. Dale R. Calder, Royal Ontario Museum, Toronto, Ontario, Canada

Dr. Cleofas Cervancia, Univ. of Philippines Los Baños College Laguna, Philippines

Dr. F.B. Vincent Florens, University of Mauritius, Mauritius

Dr. Merlin Franco, Curtin University, Malaysia

Dr. V. Irudayaraj, St. Xavier's College, Palayamkottai, Tamil Nadu, India

Dr. B.S. Kholia, Botanical Survey of India, Gangtok, Sikkim, India

Dr. Pankaj Kumar, Kadoorie Farm and Botanic Garden Corporation, Hong Kong S.A.R., China

Dr. V. Sampath Kumar, Botanical Survey of India, Howrah, West Bengal, India

Dr. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Vijayasankar Raman, University of Mississippi, USA

Dr. B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantpur, India

Dr. K. Ravikumar, FRLHT, Bengaluru, Karnataka, India

Dr. Aparna Watve, Pune, Maharashtra, India

Dr. Qiang Liu, Xishuangbanna Tropical Botanical Garden, Yunnan, China

Dr. Noor Azhar Mohamed Shazili, Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr. M.K. Vasudeva Rao, Shiv Ranjani Housing Society, Pune, Maharashtra, India

Prof. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Mandar Datar, Agharkar Research Institute, Pune, Maharashtra, India

Dr. M.K. Janarthanam, Goa University, Goa, India

Dr. K. Karthigeyan, Botanical Survey of India, India

Dr. Errol Vela, University of Montpellier, Montpellier, France

Dr. P. Lakshminarasimhan, Botanical Survey of India, Howrah, India

Dr. Larry R. Noblick, Montgomery Botanical Center, Miami, USA

Dr. K. Haridasan, Pallavur, Palakkad District, Kerala, India

Dr. Analinda Manila-Fajard, University of the Philippines Los Banos, Laguna, Philippines

Dr. P.A. Sinu, Central University of Kerala, Kasaragod, Kerala, India

Dr. Afroz Alam, Banasthali Vidyapith (accredited A grade by NAAC), Rajasthan, India

Dr. K.P. Rajesh, Zamorin's Guruvayurappan College, GA College PO, Kozhikode, Kerala, India

Dr. David E. Boufford, Harvard University Herbaria, Cambridge, MA 02138-2020, USA

Dr. Ritesh Kumar Choudhary, Agharkar Research Institute, Pune, Maharashtra, India

Dr. Navendu Page, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

Dr. Kannan C.S. Warrior, Institute of Forest Genetics and Tree Breeding, Tamil Nadu, India

##### Invertebrates

Dr. R.K. Avasthi, Rohtak University, Haryana, India

Dr. D.B. Bastawade, Maharashtra, India

Dr. Partha Pratim Bhattacharjee, Tripura University, Suryamaninagar, India

Dr. Kailash Chandra, Zoological Survey of India, Jabalpur, Madhya Pradesh, India

Dr. Ansie Dippenaar-Schoeman, University of Pretoria, Queenswood, South Africa

Dr. Rory Dowd, National Museum of Natural History Naturalis, The Netherlands

Dr. Brian Fisher, California Academy of Sciences, USA

Dr. Richard Gallon, Llandudno, North Wales, LL30 1UP

Dr. Hemant V. Ghate, Modern College, Pune, India

Dr. M. Monwar Hossain, Jahangirnagar University, Dhaka, Bangladesh

Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.

Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK

For Focus, Scope, Aims, and Policies, visit [https://threatenedtaxa.org/index.php/JoTT/aims\\_scope](https://threatenedtaxa.org/index.php/JoTT/aims_scope)

For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>

For Policies against Scientific Misconduct, visit [https://threatenedtaxa.org/index.php/JoTT/policies\\_various](https://threatenedtaxa.org/index.php/JoTT/policies_various)

continued on the back inside cover

Cover: Whale Shark *Rhincodon typus* and Reef - made with poster colours. © P. Kritika.



fish in freshwater & marine environments (Jyrwa et al. 2016). Considerable work has been conducted on several aspects of fish faunal diversity, hydrobiology, and productivity of rivers and beels of Guwahati of Assam (Dey 1981; Das & Bordoloi 1997; Saha & Bordoloi 2009). Bhalerao (1942) has made a remarkable contribution to the taxonomy of digenetic trematode parasites.

In the context of Assam, a few works have been contributed to fish parasitology. Binky et al. (2011) studied the helminth parasites of Karbhala Wetland in Cachar District of Assam. Das et al. (2012) studied the intensity of cestode parasites in *Monopterus albus* of Cachar. Das & Goswami (2014) studied the organ distribution and seasonal occurrence of parasites from three wetlands of Goalpara District. Ngasepam & Kar (2014) worked on the helminth parasites of fishes of Sone beel in Karimganj. Singha et al. (2015) studied the parasites of *Notopterus notopterus*, *Channa punctata*, and *Heteropneustes fossilis* in Dolu Lake, Silchar. The present study was undertaken to study the presence of any helminth parasites in some selected edible freshwater fishes from Deepor beel, Guwahati, Assam that were not reported hitherto from this area.

## MATERIALS AND METHODS

During the present study, fishes of the species *Mystus tengara*, *Channa punctata*, and *Trichogaster fasciata* were collected from September 2020 to August 2021 from Deepor Beel with the help from local fishermen. During the study about 200 fishes were collected and examined. Fish samples were brought to the laboratory in live condition. Serial numbers were provided for each sample, the total length and weight measured of the specimens thoroughly examined for the parasitological study. In the present study, the body cavity, kidneys, liver, stomach, and intestines were examined for the presence of endoparasites. Trematodes were collected

from the body cavity of *Trichogaster fasciata* by following Justine et al. (2012). The recovered parasites were flattened between two slides, fixed in 70% ethanol, and processed for wholemount preparation following standard procedure using Aceto alum carmine as a stain. *Clinostomum complanatum* were identified by light microscopy following Keys to Trematoda (Vol. 2) and the morphological description of *C. complanatum* by Caffara et al. (2011) and Ngamniyom et al. (2012). The morphometric measurements of the parasite were taken by using a stage and ocular micrometer.

## Preparation of the specimen for Scanning Electron Microscopy (SEM)

For Scanning Electron Microscopy (SEM), the parasite specimens were fixed in 2.5% glutaraldehyde, washed in 0.1M Sodium Cacodylate Buffer for 4 hours at 4°C before post-fixing them in 1% Osmium Tetroxide in the same buffer for 1 hour at 4°C. The specimens were then dehydrated through a graded series of acetone, dried, and mounted on brass stubs. After mounting, the specimens were coated with gold and examined with a FESEM scanning electron microscope model Zeiss Sigma 300.

## RESULTS AND DISCUSSION

A total of eighty-five middle-size *Trichogaster fasciata* were examined during the study period, and 27 were found infested with the specimen of *Clinostomum complanatum* (Image 1a,b,c). All specimen were recovered from the peritoneal cavity of the examined fishes.

## Description of trematode parasite, *Clinostomum complanatum*

**Identifying characters:** The fixed worms appear relatively stout; however, prior to fixation, the live

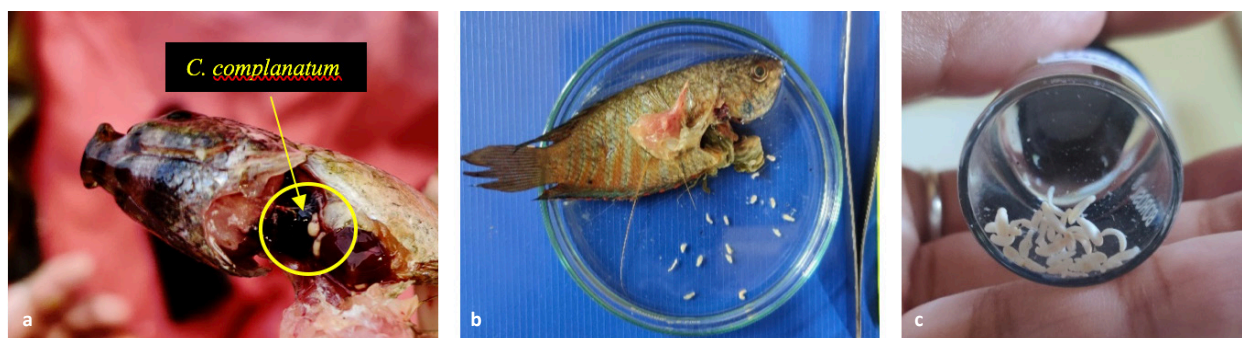


Image 1. *Clinostomum complanatum*: a—infected *T. fasciata* | b—collected in a petri dish | c—metacercariae stored in 70% ethanol. © Bobita Bordoloi.

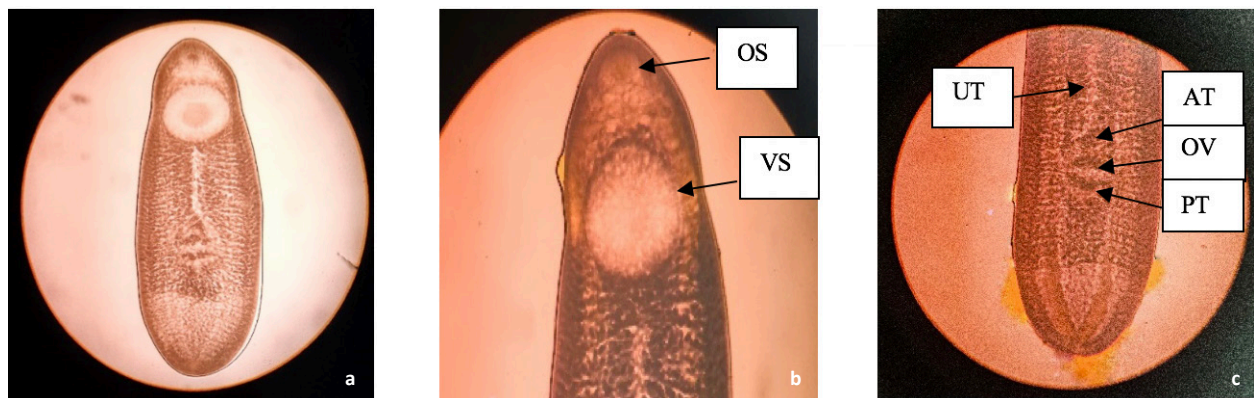


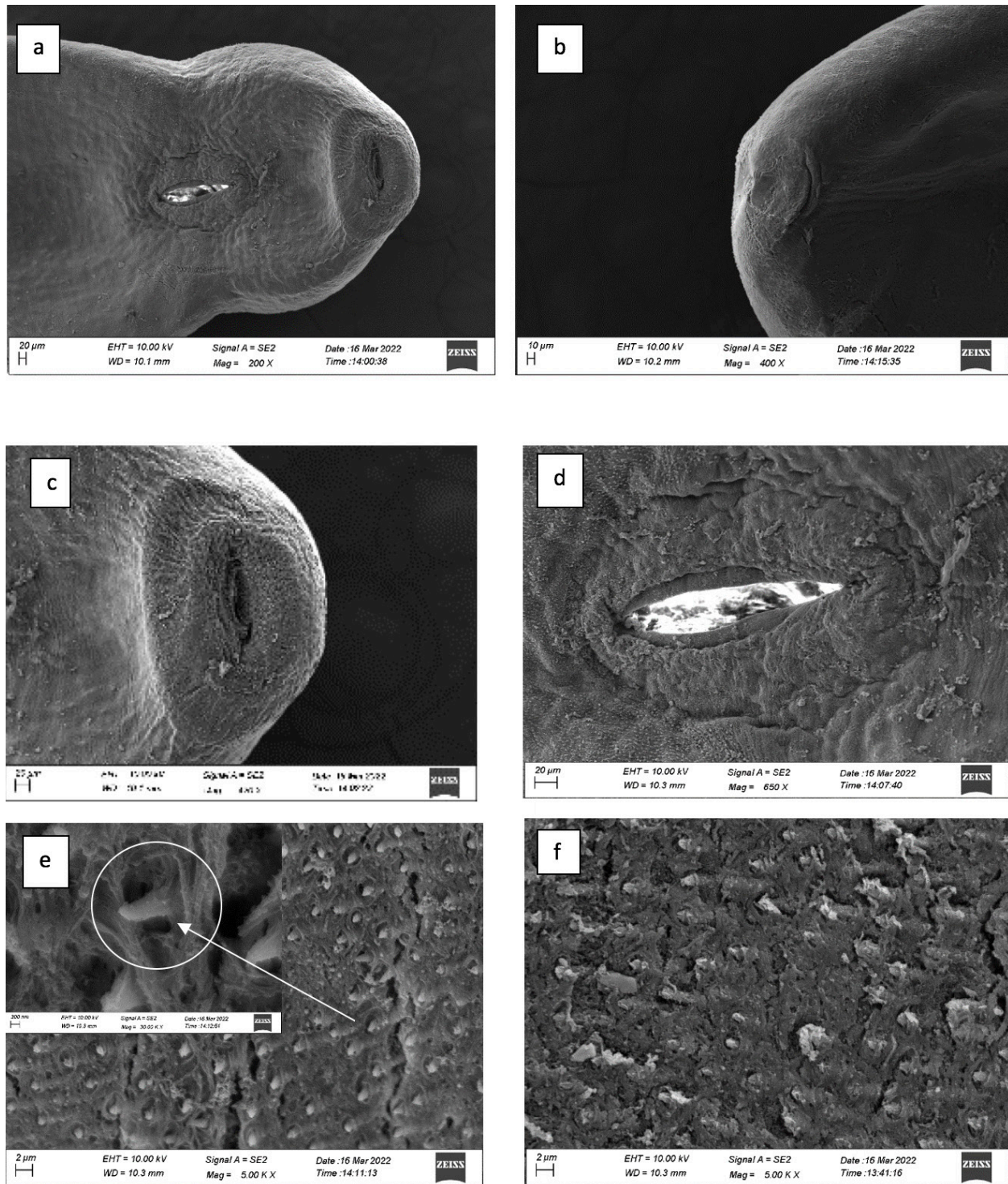
Image 2. Light microscopic structure of *Clinostomum complanatum*: a—Whole structure | b—Structure showing the position of anterior sucker (AS) and ventral sucker (VS) | c—Structure showing the position of the anterior testis (AT), posterior testis (PT), uterus (UT), and ovary (OV). © Bobita Bordoloi.

worms are very motile, exhibiting high contractility. The worm-like bodies are medium-sized to large, stout, linguiform, tongue-shaped, and bluntly rounded at the anterior and posterior ends. The body length varies between 5.7–7 mm, and the body width 1.9–2.5 mm. The body is convex dorsally and concave ventrally. Oral sucker oval, subterminal, and surrounded by collar-like folds and its surface is covered by ridges and pits. Oral sucker length ranges between 0.098–0.175 mm while the width varies between 0.200–0.395 mm. Ventral sucker muscular, well-developed, and larger than the oral positioned in the anterior half of the body. The length of the ventral sucker ranges between 0.700–0.900 mm, and the width ranges between 0.810–0.930 mm. Caeca long, simple, located in the anterior half of the body without long lateral branches and diverticula. Testes, located in posterior half of the body are smooth or irregular in shape. The anterior lobe of the testes lies in the middle, and the posterior lobe is positioned at the rear end of the parasite. The length of the anterior testis varies between 0.307–0.520 mm, and the width ranges between 0.290–0.480 mm. Posterior testis length varies between 0.292–0.500 mm, and the width varies between 0.450–520 mm. Ovary intertesticular, ovoid or rounded, median or submedian. The length of the ovary ranges between 0.149–0.164 mm, and the width ranges between 0.119–0.168 mm. Vitelline follicles are present between the posterior extremity and the level of the ventral sucker. The uterus is intercaecal, positioned between the caudal region of the ventral sucker and intertesticular space.

**Scanning electron microscopy structure:** Scanning electron microscopy of the trematode parasite revealed additional topographical features that confirmed the specimen as *Clinostomum complanatum*. The body

surface is characterized by the presence of tegumental pits and furrows with a smooth, aspinous layer. The body has rounded extremities with two suckers (one oral sucker and one ventral sucker) (Image 3a,b). Oral sucker subterminal in position with a rounded opening characterized by two collar rings and covered by ridges, pits, and dome-like papillae (Image 3c). The rim of both the oral and the sucker were aspinous and non-papillated. The oval-shaped ventral sucker positioned in the anterior half of the body exhibited sponge-like characters, and wavy wrinkles with dome-shaped papillae around the ventral sucker (Image 3d,e). The tegumental infoldings, furrows, and ridges impart stretching and contractility to the metacercariae. The dorsal surface of the parasite body revealed regularly distributed spinous protrusions (Image 3f).

The family Clinostomidae was first erected by Lühe (1901) for *Clinostomum* Leidy, 1856. In the present study, the morphometric measurements of the parasite corroborate with the study of Caffara et al. (2011) and Ngamniyom et al. (2012). Scanning electron microscopic studies of the topography of the parasite revealed additional features which correlates with the study by Abidi et al. (1988), Caffara et al. (2011), Ngamniyom et al. (2012), & Kundu et al. (2021) and confirmed the recovered parasite specimen as *Clinostomum complanatum* belonging to the family Clinostomatidae. However, Ngamniyom et al. (2012) and Caffara et al. (2011) observed spines with cytoplasmic ridges in the dorsal and the ventral region showing cobblestone-like units, but such observations were not recorded in the trematode parasites in the present study.



**Image 3.** Scanning electron microscopic structure of *Clinostomum complanatum*: a—Metacercariae showing the presence of anterior sucker (AS) and ventral sucker (VS) | b—Rounded posterior region of the metacercariae | c—Subterminal oral sucker surrounded by two collar rings and covered by ridges and pits | d—Ventral sucker surrounded by sponge-like characters, wavy wrinkles and spinous structures | e—Ventral surface of the metacercariae showing spinous characters | f—Dorsal surface of the metacercariae showing somewhat spinous structures.  
© SAIF-NEHU, Shillong, Meghalaya.

## CONCLUSION

The present study is the first report on the occurrence of trematode parasite *Clinostomum complanatum* from edible freshwater fish species *Trichogaster fasciata* collected from Deepor Beel. The edible freshwater fish *Trichogaster fasciata* were infected with the metacercariae of the trematode parasite. Along with morphological data, SEM study provides specific characteristics of the topography that helped in the identification of the trematode parasite.

## REFERENCES

- Amare, A., A. Alemayehu & A. Aylate (2014). Prevalence of internal parasitic helminthes infected *Oreochromis niloticus* (Nile Tilapia), *Clarias gariepinus* (African Catfish) and *Cyprinus carpio* (Common Carp) in Lake Lugo (Hayke), Northeast Ethiopia. *Journal of Aquaculture Research & Development* 5(3): 1–5. <https://doi.org/10.4172/2155-9546.1000233>
- Binky, K., T.H. Ranibala, M. Shomrendra & D. Kar (2011). Diversity of helminth parasites in fishes of Karbhala Wetland in Cachar district of Assam. *Environment and Ecology* 29(1): 20–21.
- Bhalerao, G.D (1942). Some metacercarial forms of Clinostomatidae (Trematoda) from India. *Proceedings of the Indian Academy of Sciences* 16: 67–71.
- Bylund, G., H.P. Fagerholm, G. Calenius, B.J. Wikgren & M. Wikstrom (1980). Parasites of fish in Finland. II. Methods for studying parasite fauna in fish. *Parasites of fish in Finland. II. Methods for studying parasite fauna in fish* 40(2): 1–23.
- Caffara, M., S.A. Locke, A. Gustinelli, D.J. Marcogliese & M.L. Fioravanti (2011). Morphological and molecular differentiation of *Clinostomum complanatum* and *Clinostomum marginatum* (Digenea: Clinostomidae) metacercariae and adults. *Journal of Parasitology* 97(5): 884–891. <https://doi.org/10.1645/GE-2781.1>
- Das, B.K., S. Kar & D. Kar (2012). Studies on Intensity of Cestodes Parasite Infecting *Monopterus albus* in Cachar District, Assam. *In Biological Forum-An International Journal* 4(2): 71–74.
- Das, P. & S. Bordoloi (1997). Fish fauna of a Torrential River (Baisistha) in Kamrup District Assam, India. *Journal of Inland Fisheries society of India* 29(1): 54–58.
- Das, D. & M.M. Goswami (2014). Distribution of Helminth parasites in different Organs and their seasonal rate of infestation in three Freshwater Fishes of Goalpara, Assam, India. *Research Journal of Animal, Veterinary and Fishery Sciences* 2(9): 13–17.
- Dey, S.C. (1981). Studies on the hydrobiological conditions of some commercially important Beels of Kamrup district of Assam and their bearing on fish production. Final technical report, NEC, 177 pp.
- Dutta, P.N. & B. Lahon (1987) Prospect and potentialities of beel fisheries in Assam, pp. 1–7. In: Compendium of Workshop on Development of Beel Fishery in Assam. Assam Agricultural University, Khanapara, Guwahati.
- Justine, J.L., M.J. Briand & R.A. Bray (2012). A quick and simple method, usable in the field, for collecting parasites in suitable condition for both morphological and molecular studies. *Parasitology Research* 111(1): 341–351.
- Jyrra, D.B., S. Thapa & V. Tandon (2016). Helminth parasite spectrum of fishes in Meghalaya, Northeast India: a checklist. *Journal of Parasitic Diseases* 40(2): 312–329.
- Keisham, L. & N. Mohilal (2020). A new species of *Procamallanus* (Nematoda: Camallanidae) From *Ailia coila* (Siluriformes, Ailiidae) from Barak River, Cachar, Assam. *Uttar Pradesh Journal of Zoology* 41(19): 47–54.
- Koiri, R., & B. Roy (2016) The seasonal incidence of parasitic helminth infection among the walking catfish, *Clarias batrachus* of Tripura, India. *Annals of Parasitology* 62(4): 307–314.
- Kundu, I., P. Bandyopadhyay & D. Mandal (2021) Redescription of trematode parasites found in *Channa punctata* Bloch, 1793 with an emphasis on Scanning Electron Microscopy Study. *Uttar Pradesh Journal of Zoology* 42(7): 10–24.
- Lebanan, K. & N. Mohilal (2021). *Camallanus sonaiensis* sp. n. (Camallanidae), a new species of nematode from *Heteropneustes fossilis* collected from Assam, India. *Journal of Parasitic Diseases* 45(3): 664–672.
- Moravec, F. & J.L. Justine (2017). Two new species of nematode parasites, *Cucullanus epinepheli* sp. n. (Cucullanidae) and *Procamallanus* (Spirocamallanus) *sinespinis* sp. n. (Camallanidae), from marine serranid and haemulid fishes off New Caledonia. *Folia Parasitologica* 64(011): 1–10. <https://doi.org/10.14411/fp.2017.011>
- Ngasepam, R.S. & D. Kar (2014). Abundance and distribution of helminth parasites in the fishes of Sone Beel, the biggest wetland in Assam. *International Journal of Scientific Research* 3(12): 148–150.
- Ngamniyom, A., M. Manaboon, B. Panyarachun (2012). Thai Medaka, *Oryzias latipes* Smith, 1945 (Belontiiformes: Adrianichthyidae): A new host species of *Clinostomum complanatum* metacercariae (Digenea: Clinostomatidae) and the surface topography by using SEM. *Chiang Mai Journal of Science* 39(3): 540–544.
- Saha, S. & S. Bordoloi (2009). Ichthyofaunal diversity of two beels of Goalpara District, Assam, India. *Journal of Threatened Taxa* 1(4): 240–242. <https://doi.org/10.11609/JoTT.o1806.240-2>
- Singha, R., M. Shomrendra & D. Kar (2015). Parasite infection of three freshwater fishes in Dolu Lake, Silchar, Assam. *International Journal of Fisheries and Aquatic Studies* 2(3): 125–127.





Dr. George Mathew, Kerala Forest Research Institute, Peechi, India  
 Dr. John Noyes, Natural History Museum, London, UK  
 Dr. Albert G. Orr, Griffith University, Nathan, Australia  
 Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium  
 Dr. Nancy van der Poorten, Toronto, Canada  
 Dr. Kareen Schnabel, NIWA, Wellington, New Zealand  
 Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India  
 Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India  
 Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India  
 Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India  
 Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India  
 Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India  
 Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain  
 Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong  
 Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India  
 Dr. M. Nithyanandan, Environmental Department, La Ala Al Kuwait Real Estate. Co. K.S.C., Kuwait  
 Dr. Himender Bharti, Punjabi University, Punjab, India  
 Mr. Purnendu Roy, London, UK  
 Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan  
 Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India  
 Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam  
 Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India  
 Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore  
 Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.  
 Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India  
 Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil  
 Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany  
 Dr. James M. Carpenter, American Museum of Natural History, New York, USA  
 Dr. David M. Claborn, Missouri State University, Springfield, USA  
 Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand  
 Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil  
 Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India  
 Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia  
 Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia  
 Dr. Siddharth Kulkarni, The George Washington University, Washington, USA  
 Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India  
 Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia  
 Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia  
 Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.  
 Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan  
 Dr. Keith V. Wolfe, Antioch, California, USA  
 Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA  
 Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic  
 Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway  
 Dr. V.P. Uniyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India  
 Dr. John T.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India  
 Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

## Fishes

Dr. Neelesh Dahanukar, IISER, Pune, Maharashtra, India  
 Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México  
 Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore  
 Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India  
 Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK  
 Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India  
 Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia  
 Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India  
 Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India  
 Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India  
 Dr. R. Ravinesh, Gujarat Institute of Desert Ecology, Gujarat, India

## Amphibians

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India  
 Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

## Reptiles

Dr. Gernot Vogel, Heidelberg, Germany  
 Dr. Raju Vyas, Vadodara, Gujarat, India  
 Dr. Pritpal S. Soorae, Environment Agency, Abu Dhabi, UAE.  
 Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey  
 Prof. Chandrashekhar U. Rivonker, Goa University, Taleigao Plateau, Goa, India  
 Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India  
 Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

## Birds

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia  
 Mr. H. Byju, Coimbatore, Tamil Nadu, India  
 Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK  
 Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India  
 Dr. J.W. Duckworth, IUCN SSC, Bath, UK  
 Dr. Rajah Jayapal, SACON, Coimbatore, Tamil Nadu, India  
 Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India  
 Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India  
 Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India  
 Mr. J. Praveen, Bengaluru, India  
 Dr. C. Srinivasulu, Osmania University, Hyderabad, India  
 Dr. K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA  
 Dr. Gombobaatar Sunde, Professor of Ornithology, Ulaanbaatar, Mongolia  
 Prof. Reuven Yosef, International Birding & Research Centre, Eilat, Israel  
 Dr. Taej Mundkur, Wetlands International, Wageningen, The Netherlands  
 Dr. Carol Inskipp, Bishop Auckland Co., Durham, UK  
 Dr. Tim Inskipp, Bishop Auckland Co., Durham, UK  
 Dr. V. Gokula, National College, Tiruchirappalli, Tamil Nadu, India  
 Dr. Arkady Lelej, Russian Academy of Sciences, Vladivostok, Russia  
 Dr. Simon Dowell, Science Director, Chester Zoo, UK  
 Dr. Mário Gabriel Santiago dos Santos, Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, Portugal  
 Dr. Grant Connette, Smithsonian Institution, Royal, VA, USA  
 Dr. M. Zafar-ul Islam, Prince Saud Al Faisal Wildlife Research Center, Taif, Saudi Arabia

## Mammals

Dr. Giovanni Amori, CNR - Institute of Ecosystem Studies, Rome, Italy  
 Dr. Anwaruddin Chowdhury, Guwahati, India  
 Dr. David Mallon, Zoological Society of London, UK  
 Dr. Shomita Mukherjee, SACON, Coimbatore, Tamil Nadu, India  
 Dr. Angie Appel, Wild Cat Network, Germany  
 Dr. P.O. Nameer, Kerala Agricultural University, Thrissur, Kerala, India  
 Dr. Ian Redmond, UNEP Convention on Migratory Species, Lansdown, UK  
 Dr. Heidi S. Riddle, Riddle's Elephant and Wildlife Sanctuary, Arkansas, USA  
 Dr. Karin Schwartz, George Mason University, Fairfax, Virginia.  
 Dr. Lala A.K. Singh, Bhubaneswar, Orissa, India  
 Dr. Mewa Singh, Mysore University, Mysore, India  
 Dr. Paul Racey, University of Exeter, Devon, UK  
 Dr. Honnavalli N. Kumara, SACON, Anaikatty P.O., Coimbatore, Tamil Nadu, India  
 Dr. Nishith Dharaiya, HNG University, Patan, Gujarat, India  
 Dr. Spartaco Gippoliti, Socio Onorario Società Italiana per la Storia della Fauna "Giuseppe Altobello", Rome, Italy  
 Dr. Justus Joshua, Green Future Foundation, Tiruchirappalli, Tamil Nadu, India  
 Dr. H. Raghuram, The American College, Madurai, Tamil Nadu, India  
 Dr. Paul Bates, Harison Institute, Kent, UK  
 Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA  
 Dr. Dan Challender, University of Kent, Canterbury, UK  
 Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK  
 Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA  
 Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India  
 Prof. Karan Bahadur Shah, Budhanilakantha Municipality, Kathmandu, Nepal  
 Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraja, Indonesia  
 Dr. Hemanta Kafley, Wildlife Sciences, Tarleton State University, Texas, USA

## Other Disciplines

Dr. Aniruddha Belsare, Columbia MO 65203, USA (Veterinary)  
 Dr. Mandar S. Paingankar, University of Pune, Pune, Maharashtra, India (Molecular)  
 Dr. Jack Tordoff, Critical Ecosystem Partnership Fund, Arlington, USA (Communities)  
 Dr. Ulrike Streicher, University of Oregon, Eugene, USA (Veterinary)  
 Dr. Hari Balasubramanian, EcoAdvisors, Nova Scotia, Canada (Communities)  
 Dr. Rayanna Hellem Santos Bezerra, Universidade Federal de Sergipe, São Cristóvão, Brazil  
 Dr. Jamie R. Wood, Landcare Research, Canterbury, New Zealand  
 Dr. Wendy Collinson-Jonker, Endangered Wildlife Trust, Gauteng, South Africa  
 Dr. Rajeshkumar G. Jani, Anand Agricultural University, Anand, Gujarat, India  
 Dr. O.N. Tiwari, Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India  
 Dr. L.D. Singla, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India  
 Dr. Rupika S. Rajakaruna, University of Peradeniya, Peradeniya, Sri Lanka  
 Dr. Bahar Baviskar, Wild-CER, Nagpur, Maharashtra 440013, India

## Reviewers 2019–2021

Due to pausity of space, the list of reviewers for 2018–2020 is available online.

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

**Journal of Threatened Taxa** is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:  
 The Managing Editor, JoTT,  
 c/o Wildlife Information Liaison Development Society,  
 43/2 Varadarajulu Nagar, 5<sup>th</sup> Street West, Ganapathy, Coimbatore,  
 Tamil Nadu 641035, India  
 ravi@threatenedtaxa.org



www.threatenedtaxa.org

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at [www.threatenedtaxa.org](http://www.threatenedtaxa.org). All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

January 2023 | Vol. 15 | No. 1 | Pages: 22355–22558

Date of Publication: 26 January 2023 (Online & Print)

DOI: 10.11609/jott.2023.15.1.22355-22558

## Communications

### Asiatic Black Bear *Ursus thibetanus* attacks in Kashmir Valley, India

– Aaliya Mir, Shanmugavelu Swaminathan, Rashid Y. Naqash, Thomas Sharp & Attur Shanmugam Arun, Pp. 22355–22363

### Food habits of the Red Fox *Vulpes vulpes* (Mammalia: Carnivora: Canidae) in Dachigam National Park of the Kashmir Himalaya, India

– Kulsum Ahmad Bhat, Bilal A. Bhat, Bashir A. Ganai, Aamir Majeed, Naziya Khurshid & Muniza Manzoor, Pp. 22364–22370

### Status distribution and factors affecting the habitat selection by Sambar Deer *Rusa unicolor* in Pench Tiger Reserve, Madhya Pradesh, India

– Abdul Haleem & Orus Ilyas, Pp. 22371–22380

### Assessing illegal trade networks of two species of pangolins through a questionnaire survey in Nepal

– Nikita Phuyal, Bipana Maiya Sadadev, Reeta Khulal, Rashmi Bhatt, Santosh Bajagain, Nirjala Raut & Bijaya Dhami, Pp. 22381–22391

### First occurrence record of Indian Roundleaf Bat *Hipposideros lankadiva* in Rajasthan, India

– Dharmendra Khandal, Dau Lal Bohra & Shyamkant S. Talmale, Pp. 22392–22398

### Food availability and food selectivity of Sri Lanka Grey Hornbill *Ocyrceros gingalensis* Shaw, 1811 in Mihintale Sanctuary, Sri Lanka

– Iresha Wijerathne, Pavithra Panduwawala & Sriyani Wickramasinghe, Pp. 22399–22409

### Conservation significance of Changaram wetlands - a key wintering site for migratory shorebirds and other waterbirds in the western coast of Kerala, India

– Jasmine Anand, H. Byju, Aymen Nefla, S. Abhijith, Omer R Reshi & K.M. Aarif, Pp. 22410–22418

### Long-term monitoring of pelicans in National Chambal Sanctuary, India

– Lala A.K. Singh & Rishikesh Sharma, Pp. 22419–22429

### A checklist of avifauna of Mangalore University, Karnataka, India

– K. Maxim Rodrigues, K. Vineeth Kumar, Vivek Hasyagar, M.C. Prashantha Krishna & Deepak Naik, Pp. 22430–22439

### Biology of *Bhutanitis ludlowi* Gabriel, 1942 (Lepidoptera: Papilionidae) Bumdeling Wildlife Sanctuary, Bhutan

– Tshering Dendup, Namgay Shacha, Karma Tempa & Tez Bdr Ghalley, Pp. 22440–22447

### Biodiversity of butterflies (Lepidoptera: Rhopalocera) in the protected landscape of Nandhour, Uttarakhand, India

– Hem Chandra, Manoj Kumar Arya & Aman Verma, Pp. 22448–22470

### A comparison of four sampling techniques for assessing species richness of adult odonates at riverbanks

– Apeksha Darshetkar, Ankur Patwardhan & Pankaj Koparde, Pp. 22471–22478

### Floristic diversity of native wild ornamental plants of Aravalli Hill Range: a case study from district Rewari, Haryana, India

– Pradeep Bansal, Amrender Singh Rao, Surender Singh Yadav, M.S. Bhandoria & S.S. Dash, Pp. 22479–22493

### Flowering and fruiting of Tape Seagrass *Enhalus acoroides* (L.f.) Royle from the Andaman Islands: observations from inflorescence buds to dehiscent fruits

– Swapnali Gole, Sivakumar Kuppusamy, Himansu Das & Jeyaraj Antony Johnson, Pp. 22494–22500

## Short Communications

### Status of Swamp Deer *Rucervus duvaucelii duvaucelii* (G. Cuvier, 1823) in grassland-wetland habitats in Dudhwa Tiger Reserve, India

– Sankarshan Rastogi, Ashish Bista, Sanjay Kumar Pathak, Pranav Chanchani & Mudit Gupta, Pp. 22501–22504

### First photographic evidence of Indian Pangolin *Manis crassicaudata* Geoffroy, 1803 (Mammalia: Pholidota: Manidae), in Colonel Sher Jung National Park, Himachal Pradesh, India

– Nidhi Singh, Urjit Bhatt, Saurav Chaudhary & Salvador Lyngdoh, Pp. 22505–22509

### The Marine Otter *Lontra felina* (Molina, 1782) (Mammalia: Carnivora: Mustelidae) along the marine protected areas in Peru

– José Pizarro-Neyra, Pp. 22510–22514

### First record of the genus *Acropyga* Roger, 1862 (Hymenoptera: Formicidae: Formicinae) in Kerala, India

– Merin Elizabeth George & Gopalan Prasad, Pp. 22515–22521

### First report of a coreid bug *Aurelianus yunnananus* Xiong, 1987 (Hemiptera: Heteroptera: Coreidae) from India

– Hemant V. Ghate, Pratik Pansare & Rahul Lodh, Pp. 22522–22527

### First record of the long-horned beetle *Niphona fuscatrix* (Fabricius, 1792) (Coleoptera: Cerambycidae: Lamiinae) from the Western Ghats, India

– Yogesh K. Mane, Priyanka B. Patil & Sunil M. Gaikwad, Pp. 22528–22532

### Incidence of *Clinostomum complanatum* (Trematoda: Clinostomidae) in *Trichogaster fasciata* (Actinopterygii: Osphronemidae), the first report from Deepor Beel, Assam, India

– Bobita Bordoloi & Arup Kumar Hazarika, Pp. 22533–22537

### *Sauromatum horsfieldii* (Araceae): a new addition to the flora of Manipur, northeastern India

– Kazuhrii Eshuo & Adani Lokho, Pp. 22538–22542

### *Rhynchostegiella menadensis* (Sande Lac.) E.B. Bartram and *R. scabriseta* (Schwagr.) Broth.: two new records of mosses (Brachytheciaceae: Bryophyta) for peninsular India

– V.K. Rajilesh, C.N. Manju & R. Prakashkumar, Pp. 22543–22547

## Notes

### Installation of hot boxes for conservation in the last nursery roost of Greater Horseshoe Bats *Rhinolophus ferrumequinum* in Austria

– Lukas Zangl, Alexander Gutstein, Wolfgang Paill, Edmund Weiss & Peter Sackl, Pp. 22548–22550

### New prey record of giant ladybird beetle *Anisolemnia dilatata* (Fabricius) (Coccinellidae: Coleoptera) feeding on Som Plant Aphid *Aiceona* sp.

– Suprakash Pal, Biwash Gurung, Ponnusamy Natarajan & Partha Sarathi Medda, Pp. 22551–22555

## Book Review

### Book Review - Under the Feet of Living Things

Editors — Aparajita Datta, Rohan Arthur & T.R. Shankar Raman

– Review by Melito Prinson Pinto, Pp. 22556–22558

Publisher & Host

